susan wilson

91

Homework 2

Problem 1:

a. CMPT 333 - variable

b. Cmpt 333 - Constant

c. 333 - Constant

d. "Cmpt 333" - Constant

e. $p(x, x)$ - ground Atomic formula

f. $p(3, 9, 5)$ - ground atomic formula

g. "$p(3, 9, 5)$" - Constant

Problem 2:

What grade did L. Van. Pelt get in "Cmpt 220"?

C: "Cmpt 220"
N: "L. Van Pelt"

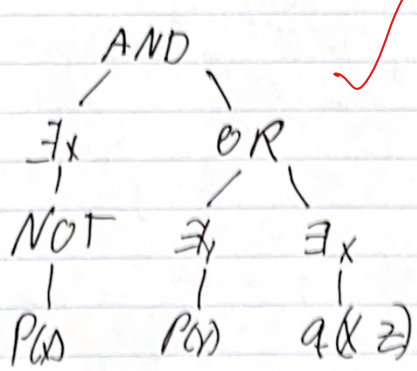
Sg("Cmpt 220", S, G) AND snap(S, "L. Van Pelt", A, P) → answer(G)

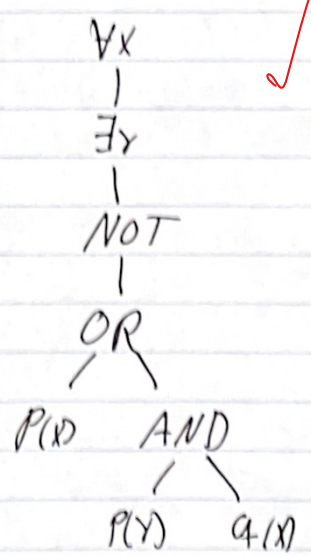
Problem 3:

a. $(\forall x)(\exists y)$ NOT ($P(x)$ OR $P(y)$ AND $q(x)$)

b. $(\exists x)$ NOT $P(x)$ AND ($(\exists y)$ $P(y)$ OR $(\exists x)$ $q(x, z)$)

Problem 4:





Problem 5:

$(\exists x)$ NOT $P(x)$ AND $((\exists y) P(y)$ OR $(\exists x)\, q(x,z))$

Problem 6:

C. Brown is an A Student

N: "C. Brown"
G: "A"

-4

Problem 2:

a. $(\forall x)(\exists y)(\text{loves}(x,y))$

D: a, b, c

True	False
loves(a, b)	loves(b, a)
loves(c, b)	loves(c, a)
loves(b, a)	

b. $P(x) \rightarrow$ NOT $P(x)$

~~[illegible]~~

$\boxed{\begin{array}{l} P(x): \text{False} \\ P(x): \text{TRUE} \end{array}}$ - makes the expression true
- makes the expression false

c. $(\exists x)\, P(x) \rightarrow (\forall x)\, P(x)$

$P(x)$: a $P(a)$ is true

$P(a,b)$: $P(a) \rightarrow (\forall x) P(b)$ is false

d.

D: a, b, c
$P(x,y)$ = true if ab, bc, ac

D: a, b, c
$P(x,y)$ = false if cb

Problem 8:

a. Tautology due to commutative property

$P(x)$ OR $q(y) \equiv q(y)$ OR $P(x)$

b. Tautology due to Reflexivity of equivalence

c. If $P(x) \to$ true ~~then~~ is equivalent to $P(x)$
then $P(x) \to$ false is equivalent to NOT $P(x)$
via Implication of AND and OR.

Problem 9:

a. $(\forall x)(P(x))$ AND $((\exists y)(P(y)))$ OR $((\exists x)(q(x,z))))$

– $\boxed{(\exists x)(\text{NOT}(P(x)))\ \text{AND}\ ((\exists y)P(y))\ \text{OR}\ ((\exists A)\ q(A,z)))}$

b. $\boxed{(\exists x)(\exists y)\ P(y)\ \text{OR}\ (\exists z)\ q(z)\ \text{OR}\ r(x)}$

Problem 10:

~~$P(x,y)$ AND $(\forall y)$~~ $\boxed{\text{a. } (\forall x)\ P(x,y)\ \text{AND}\ (\exists y)\ q(y)}$

~~b. $(\exists x)(P(x,y)$~~

b. $\exists x((\forall y)(P(x,y)$ OR $(\exists z)(\forall g)P(g,z))$

-3

Problem 11:

No, the law does not allow us to change the quantification.
The $(\exists x)\, q(x)$ will not be equal to $\exists x\, P(x)$ and q because the quantifier is the same

Problem 12:

a. ~~$\forall x\, P(x)$ AND $(\exists y)(P(y))$ OR $(\exists x)\, q(x,z)$~~

~~$(\exists a)(\exists x)(\exists y)((P(a)$ AND $(P(y))$ OR $q(x,z)))$~~

$\boxed{\text{NOT } (\forall x)(\exists y)(\exists A)\,(P(x) \text{ and } P(y) \text{ or } q(A,z))}$

~~b. NOT $\forall x$~~

b. ~~$(\exists x)(\exists z)(\exists A)(P(x)$ OR~~
$(\exists x)(\exists z)(\exists A)\; P(x)$ OR $Q(A)$ OR $r(A)$

Problem 13:

quantifiers means through the $\rightarrow$ operator translate from $(\forall x)$ to $(\exists x)$ and vice versa, the other side is also negated once a q constant is added

With respect to the example, there are no quantifiers

The ~~constant~~ constants is need to ~~be~~ be negated

Problem 14:

1. NOT $((\exists x)(\exists y)\, p(x,y))$

$\forall x\ \forall y$ NOT $p(x,y)$

2. NOT $((\exists x)\, p(x)$ OR $(\exists y)\, q(x,y))$

$\forall x\ \forall y$ NOT $p(x)$ OR $q(A,y)$

-2

Problem 15:

no, $(\exists x)F$ means there exists an x meaning there will be an ~~[illegible]~~ instance instance of $(\exists x)$ where $\exists$ is not a tautology

2